

Kudremukh National Park (13° 06' N; 75° 18' E). According to the previous reports, this gecko is known to occur on walls of houses, barks of trees, lichen-covered black granite rocks (Jadhav *et al.* 1991; Tikader and Sharma 1992; Giri and Bauer 2006). In addition to spotting the adult geckos on walls and crevices of buildings, barks and within buttresses of trees, we have also seen many individuals on huge rocks along the river courses in the nights. We found the gecko from 40-820 m above msl.

It is thus noteworthy to mention this new locality report, which extends the distribution of this species by c. 150 km (aerial distance) towards south. This suggests that this species ranges widely throughout the central Western Ghats and its

presence in the forests of Kodagu, which are contiguous with the Kudremukh hills, needs to be confirmed.

ACKNOWLEDGEMENTS

We thank the Karnataka Forest Department and their staff for funding, permission and support. We thank Dr. Karthikeyan Vasudevan, Shri. Vijay Ranjan Singh and Shri. M.S. Chaitra for their guidance, support and encouragement. Thanks to Mr. Varad Giri for the information he provided. We thank Mr. Shashank Dalvi and Ms. Swapna N. for their support during the survey.

REFERENCES

- GIRI, V. & A.M. BAUER (2006): Notes on the distribution, natural history and variation of *Hemidactylus prashadi* Smith, 1935. *Hemadryad* 30: 55-60.
- JADHAV, S.P., L.T. MOTE & P.K. VADAR (1991): Ecological notes on niche of new and rare geckonid lizard, *Hemidactylus prashadi*. *Geobios New Reports* 10: 69-70.
- SHARMA, R.C. (2002): The fauna of India and the adjacent countries. Reptilia, Volume II (Sauria). Zoological Survey of India, Kolkata. xxv + 430 pp.
- SMITH, M.A. (1935): The Fauna of British India, including Ceylon and Burma: Reptilia and Amphibia. Volume II: Sauria. Taylor & Francis, London. xiii + 440 pp. + 1 plate.
- TIKADER, B.K. & R.C. SHARMA (1992): The Handbook of Indian Lizards. Zoological Survey of India, Kolkata. xv + 250 pp. + 42 plates.
- VASUDEVAN, K., M. SINGH, V.R. SINGH, M.S. CHAITRA, R.S. NANIWADEKAR, V. DEEPAK & N. SWAPNA (2006): Survey of biological diversity in Kudremukh forest complex, Karnataka. Final Survey Report of Kudremukh WL Division.

12. OCCURRENCE OF FLYING FISH, *CHEILOPOGON ABEI* PARIN, 1996 FROM NEARSHORE WATERS OF THE NORTH-WEST COAST OF INDIA

SUJIT SUNDARAM¹

¹Mumbai Research Centre of Central Marine Fisheries Research Institute, 2nd Floor, C.I.F.E old campus, Fisheries University Road, Seven Bungalows, Andheri (W), Versova, Mumbai 400 061, Maharashtra, India. Email: sujitsundaram@hotmail.com

Introduction

Flying fish (Family: Exocoetidae) are common in tropical and subtropical waters. They form an important fishery resource world over, especially in countries such as Indonesia, Japan (Parin 1960), USA (Herald 1969), West Africa (Gibbs 1981) etc. Parin (1961) gave an account of the Exocoetid fauna of the Indian Ocean, and Day (1877, 1889) has described six species of flying fish from India.

Since flying fishes are capable of leaping out of water and gliding for short distances above the surface they are commonly called as 'flying mullet' and they are a significant component of the epipelagic food chain (Parin 1968). In Maharashtra, they are locally known as 'Kawla maasa' meaning 'Crow fish'. Flying fishes have been occasionally reported from different centres along the coastal strip of India. Rao and Basheeruddin (1973) gave an account of the fishery of the species *Parexocoetus brachypterus brachypterus* (Richardson), including the size-composition, sex-ratio, maturity studies and diet from Madras (=Chennai) waters. Development of egg and larvae studies was carried out by Vijayaragavan (1973). Hornell (1923), Arora and Banerji

(1957), and Pajot and Prabhakaradu (1993) described the flying fish fishery along the Coromandel coast, south-east India.

Sundaram and Sarang (2003) and Kizhakudan *et al.* (2002) have reported the species *Cheilopogon furcatus* (Mitchill 1815) from Mumbai and Veraval waters respectively. Three other species of flying fish *Cheilopogon nigricans* (Bennett 1840), *Cheilopogon suttoni* (Whitley & Colefax, 1938) and *Hirundichthys oxycephalus* (Bleeker 1852) were also reported from Mumbai waters (Kamble *et al.* 2007).

Material and Methods

During May 2007, about 75 kg of flying fishes were landed by trawlers at New Ferry Wharf (*Bhaucha Dhakka*), Mumbai, Maharashtra. The depth of fishing operation was at 20-30 m, 50-60 km off north-west coast in Mumbai waters. About 2 kg of sample was brought to the laboratory for identification and further biological analysis. Total length was measured using a digital calliper and total weight (± 0.01 gm) was determined using an electronic balance after the specimens were dried on blotting paper. The measurements

were taken as described by CMFRI (1995). Four specimens ranging in total length from 222-247 mm with the corresponding body weight ranging from 73.86-92.17 gm were studied for morphometric and meristic characters.

Results and Discussion

The species was identified as *Cheilopogon abei* Parin, 1996 (Family: Exocoetidae, Order: Beloniformes and Class: Actinopterygii) based on the detailed identification characters as described in Parin (1996). A total of 23 morphometric characters and 5 meristic counts were recorded and are given in Table 1.

The body of *C. abei* is elongate, broadly cylindrical and flattened dorsally. The standard length and fork length of the species is 77.3% and 83% of the total length (TL). The pectoral fin length was 58.2% and 75.3% of the total length and standard length respectively. The other morphometric characteristics in relation to TL was greatest body depth (13.5%), head length (18.6%), pelvic fin length (23.3%), dorsal fin length (9.9%), anal fin base length (9.4%), caudal fin upper lobe (17.5%) and caudal fin lower lobe (25.4%). The pre orbital, orbital length and inter orbital distance was 27%, 34.5% and 45.4% of the head length. Head is slightly shorter than the distance between dorsal fin origin and base. The lower jaw is pointed and is somewhat longer than the upper one when the mouth is closed. The jaw teeth are numerous, of average size, located in 2-3 rows, and palatine teeth are also present. The dorsal fin is rather high, it is the longest second and the origin of anal fin is six rays behind the origin of dorsal fin. The pectoral fins are strikingly long and reach the origin of the upper tail lobe. The pelvic fins reach the beginning of the 2-3rd ray of the anal fin base. The caudal fin is deeply forked and its lower lobe is longer than the upper. The lateral line is without branch at thorax and the scales are large and cycloid. The pectoral fins have 13-14 rays, dorsal fin has 13-14 rays, pelvic fins have 8-9 rays, anal fin has 9-10 rays and caudal fin rays ranged from 23-24.

The dorsal fin is grayish, with two bright black spots between the 4th-6th ray and between 10th-11th ray. The anal fin is without pigmentation. The pectoral fins are black, with a prominent bright yellow band 'mirrow' running through it, narrowing towards the upper margin and reaches the 1-3rd ray. The pelvic fins have a bright black spot in their back half and do not reach the posterior edge of the fin. The caudal fin is evenly dark gray. The body is dark above and pale below and usually iridescent blue in life.

C. abei occurs in the western equatorial part of the Pacific Ocean (up to Solomon Islands in the east), the inland seas of south-east Asia, the Indian Ocean northwards of 15-20° S, the Bay of Bengal and the Arabian Sea. In the Pacific

Table 1: Morphometric and meristic characteristics of *Cheilopogon abei*

	Specimen 1	Specimen 2	Specimen 3	Specimen 4
Morphometric (mm)				
Total length	222	232	237	247
Standard length	165	179	188	193
Fork length	182	195	198	204
Greatest body depth	26	32	33	36
Head length	37	44	46	47
Pectoral fin length	122	135	140	149
Pelvic fin length	50	55	56	58
Caudal peduncle length	14	17	18	20
Caudal peduncle depth	13	14	15	17
Dorsal fin base length	33	35	37	39
Dorsal fin length	20	22	24	27
Anal fin base length	17	22	23	26
First anal ray length	10	12	13	15
Pelvic fin base length	6	8	10	12
Pre orbital	9	12	13	13
Eye diameter	14	15	15	16
Inter orbital width	18	19	20	22
Post orbital distance	18	19	19	20
Upper jaw length	10	11	12	13
Lower jaw length	13	17	18	19
Caudal fin upper lobe	39	40	41	44
Caudal fin lower lobe	53	60	61	64
Weight in gm	73.86	82.67	85.21	92.17
Meristic counts				
Pectoral rays	13	14	14	14
Dorsal rays	13	13	14	14
Pelvic rays	8	8	8	9
Anal rays	9	9	10	10
Caudal rays	23	23	24	24

Ocean it is distributed as a neritic species, and in the Indian Ocean as a neritic oceanic species (Parin 1996). The present report of this species from Mumbai waters, north-west coast of India seems to be the first record from this region.

C. furcatus is a common species similar to *C. abei* in appearance but its band pattern on the pectoral fin varies slightly. In addition, it does not have a dark spot on the dorsal and pelvic fins. *C. abei* also appears to be similar to *C. nigricans* but differs well from this species due to the yellow coloration of the 'mirrow' on the pectoral fins and in the presence of a black spot on the pelvic fin.

According to Parin (1996), the maximum length of *C. abei* from the Pacific Ocean does not exceed 210 mm, whereas it is common to find larger fishes in the Indian Ocean, even up to 250 mm. The maximum length recorded in the present observation was 247 mm.

Flying fish is a tropical pelagic fish and characteristic of surface layers of seas (Bruun 1935) and the occurrence of flying fishes in inshore waters may be because they migrate

towards shallow water areas from offshore waters for feeding. According to Rao and Basheeruddin (1973), migration may also be for spawning. The observed specimens of this species were in mature condition. Though flying fishes may show stray occurrences throughout the year, the period of abundance is during post monsoon. In May 2007, the sea was very turbulent off Mumbai. Turbulence generally results in transport of nutrients from deeper waters, inducing increased planktonic productivity, and hence increased abundance of zooplankton on which flying fish feed (Oxenford *et al.* 1995). This phenomenon could have led to the occurrence of this species during this period in Mumbai waters in such large numbers.

According to Parin (1996), flying fishes are objects of fisheries that are fished in many tropical countries, and practical requirements of fishery demand the knowledge of the species composition of this group in certain regions. Regional distribution and relative abundance of flying fishes have not

been studied extensively along the Indian coast, and therefore efforts need to be taken in this direction and also regarding the commercial exploitation of these fishes. A specimen of *C. abei* has been deposited in the Reference Collection Museum of Central Marine Fisheries Research Institute, Kochi.

ACKNOWLEDGEMENTS

I am grateful to Dr. N.V. Parin, Institute of Oceanology, Russian Academy of Sciences IO RAS, Moscow for confirming the identity of the species. I thank Dr. V.D. Deshmukh, Principal Scientist and Scientist-in-Charge, CMFRI, Mumbai, Dr. Miriam Paul Shreeram, Senior Scientist, Marine Biodiversity Division, CMFRI, Mangalore, and Mrs. T.S. Naomi, Principal Scientist, Marine Biodiversity Division, CMFRI, Kochi. The help rendered by J.R. Dias, S.D. Kamble and J.D. Sarang is also acknowledged.

REFERENCES

- ARORA, H.L. & S.K. BANERJI (1957): Flying fish fishery along the Coromandel coast. *Indian J. Fish* 4(1): 80-91.
- BRUUN, A.F. (1935): Flying-fishes (Exocoetidae) of the Atlantic-Systematic and Biological studies. *Dana Report* 2(6): 1-106.
- CMFRI (1995): A manual for standardised linear measurements of exploited finfish and shellfish. *CMFRI Sp. Pub.* 78 pp.
- DAY, F. (1877): The Fishes of India. Bernard Quaritch, London Part 3: 369-552.
- DAY, F. (1889): The Fauna of British India, including Ceylon and Burma. Taylor and Francis. London. Vol. 1. 548 pp.
- GIBBS, R.H. JR. (1981): Exocoetidae, flying fishes. In: Fischer, W., G. Bianchi & W.B. Scott (Eds): FAO species identification sheets for fishery purpose. *Eastern Central Atlantic, fishing area* 34, 47 (in part), Vol 2. Var. Canada funds-in-trust, Ottawa. Department of fisheries and Oceans, Canada, by arrangement with FAO of the UN.
- HERALD, E.S. (1969): Living Fishes of the World. Chanticleer Press, New York. 304 pp.
- HORNELL, J. (1923): The flying fish fishery of the Coromandel coast and the spawning habits of *Cypsilurus*. *Madras Fish Bull.* 15: 99-108.
- KAMBLE, S.K., S. SUNDARAM, M.P. SREERAM & J.D. SARANG (2007): Record of three species of flying fish from Mumbai Waters. *Mar. Fish. Infor. Serv., T and E ser.* No. 194: 19-20.
- KIZHAKUDAN, J.K., J.K. SHOBA, V.D. SAVARIA, J.D. VANVI, A.A. LADANI, J.P. POLARA & A.P. BHARANDA (2002): Unusual landings of flying fish, *Cheliopogon furcatus* (Mitchill, 1815) in Veraval, Mangrol and Chorward. *Mar. Fish. Infor. Serv. T and E ser.* No.171: 10.
- OXENFORD, H.A., R. MOHON & W. HUNTE (1995): Distribution and relative abundance of flying fish (Exocoetidae) in the eastern Caribbean. I. *Adults. Mar. Ecol. Prog. Ser.* 117: 11-23.
- PAJOT, G. & C.R. PRABHAKARADU (1993): Flying fish fishing on the Coromandel coast, 1988-1991. *BOBP/WP/84*, Bay of Bengal Programme. Project Report. Madras. 21 pp.
- PARIN, N.V. (1960): Flying fish (Exocoetidae) of the north-western part of the Pacific Ocean. *Tr. Inst. Okean. Akad. Nauk SSSR* 31: 205-285.
- PARIN, N.V. (1961): On the Exocoetid fauna of the Pacific and Indian Oceans. *Trudy Inst. Okeanol.* 43: 40-92.
- PARIN, N.V. (1968): Ichthyofauna of the epipelagic zone. *Israel Program. Sci. Transl.*
- PARIN, N.V. (1996): On the species composition of flying fishes (Exocoetidae) in the West-Central part of tropical Pacific. *J. Ichthyol.* 36(5): 357-364.
- RAO, K.S. & S. BASHEERUDDIN (1973): Unusual catches of the flying fish, *Parexocoetus brachypterus brachypterus* (Richardson) in inshore waters at Madras. *Indian J. Fish.* 20(2): 629-634.
- SUNDARAM, S. & J.D. SARANG (2003): Stray landing of flying fish *Cheliopogon furcatus* (Mitchill, 1815) at New Ferry Wharf, Mumbai. *Mar. Fish. Infor. Serv., T and E ser.* No.175: 12.
- VIJAYARAGAVAN, P. (1973): Studies on fish eggs and larvae from Indian waters. I. Development of egg and larvae of *Hirundichthys (Hirundichthys) coromandelensis* (Hornell). *Indian J. Fish.* 20(1): 108-137.

13. BEE PASTURAGE PLANTS OF *APIS FLOREA* IN KHAMMAM REVENUE DIVISION, KHAMMAM DISTRICT, ANDHRA PRADESH, INDIA

A. VIJAYA BHASKER REDDY^{1,2} AND P. RAMACHANDRA REDDY¹

¹Department of Botany, P.G. College of Science, Saifabad, Hyderabad 500 004, Andhra Pradesh, India.

²Email: vijayabhaskerredy@yahoo.co.in

Introduction

Melissopalynology, one of the branches of palynology finds a very significant application in the field of apiculture.

A qualitative and quantitative pollen analysis of honey provides the only means of identifying the bee pasturage plants in any locality (Kalpana TP, Ramanujam CGK-1996A).